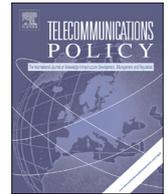


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Telecommunications Policy

URL: www.elsevier.com/locate/telpol

Editorial

Regulatory approaches and investment in new communications infrastructure

1. Setting the scene

This special issue collects a series of papers with a specific focus on regulation and investment in new (second or next generation) fiber-based communications infrastructure. Three of the papers were presented at the 23rd European Regional Conference of the International Telecommunication Society held in Vienna, Austria, July 1–3, 2012, and hosted by the Vienna University of Economics and Business. Three other papers represent contributions to the call for papers announced in the context of this conference and also open to other papers. The selected papers address in part different scenarios of fiber-based infrastructure deployment and the methodological approaches adopted differ significantly. Notwithstanding these differences, all the papers cover some highly relevant issues of the debate with a common focus on the fiber-based deployment of wireline access technologies, where regulatory issues are of much greater importance than in wireless deployment scenarios. The selected papers also have a common theme with respect to sector-specific ex-ante regulation as they are all – more or less explicitly – explored within the context of the regulatory framework of the European Union (EU).

One of the most controversial regulatory issues in Europe (and elsewhere) is whether emerging communications infrastructure should be subject to sector-specific regulation or not. Former telecommunications monopolists (“incumbents”) argue that sector-specific regulation is detrimental to investment incentives and infrastructure innovation. Accordingly, the roll-out of new infrastructure could only, if at all, be done on the basis of deregulation of relevant markets; at least a temporary removal of ex-ante obligations is deemed to be essential. Conversely, alternative operators who are dependent on access regulation, as well as some national regulatory authorities, fear the rise of another monopolistic bottleneck infrastructure if regulation is released or removed entirely. In any case, the regulatory approach will have a crucial influence on forward-looking investment decisions.

In deploying new communications infrastructure, investing operators are confronted with significant capital outlays, as well as with great uncertainty and high risks, most notably those related to future demand and pending regulations, which negatively affect investment decisions. Investment volumes are of much greater magnitude than previous investments required for upgrading first generation copper networks to facilitate broadband services. As the deployment of fiber networks is also subject to high sunk costs and uncertainty, it appears unlikely that nationwide investments will be induced by competition and private investment activities alone. Hence, a further point of discussion refers to the role of national and local governments in promoting public subsidies, as well as different scenarios of investment sharing in order to facilitate a broad-scale infrastructure roll-out and to minimize total deployment costs. In attracting investment in new communications infrastructure, one observes quite different regulatory and governmental policies in international comparisons: in the EU, for example, regulated wholesale broadband access prices are usually based on diverse cost-oriented standards, established from the very beginning of the liberalization process in electronic communications markets in 1997/1998. It appears that the European Commission (EC) is, in principle, determined to extend the same approach also to regulating new communications infrastructure. In turn, many of the leading East-Asian fiber network countries take a rather pronounced state aid driven approach, and the United States has adopted a deregulatory and primarily market-driven strategy.

In general, ex-ante regulation brings a trade-off between static and dynamic efficiency, which is well recognized in the theoretical and empirical literature and which holds particularly true for the roll-out of next generation communications infrastructure. The EU regulatory framework has tried to resolve the trade-offs of dynamic and static efficiency with reference to the so-called “ladder of investment” approach, which is also seen as a guiding principle for next generation access networks. But what are the long-term implications of the current and prospective EU regulatory frameworks in terms of investment, innovation and welfare? Is there any supportive evidence for the ladder of investment or the need for continuity in approach in view of emerging infrastructure? What is the role played by regulatory uncertainty and commitment in view of risky ex-ante investment decisions? If ex-ante regulation is to be imposed on second generation

infrastructure, what is the most appropriate form of regulating wholesale access to fiber networks in view of the fact that first and second generation infrastructure will be operated in parallel in the mid-term? Finally, and against the background of the massive investment volumes required, what are the potential cost savings of different infrastructure sharing scenarios and what do they imply in terms of competition, investment and consumer welfare? Answering these questions is extremely important for future policy decisions which are still an open issue or not yet implemented in many EU member states. Moreover, particular significance is attached to such policy decisions with regard to the fundamental impact of new communications infrastructure on economic prosperity in any information society. This special issue contains six papers that provide new insights and answers to the questions raised above on the basis of different analytical perspectives and varying evidence. Each of these papers is described in further detail in the relevant section below.

2. Assessing the EU regulatory framework

The first paper in the special issue is “The deployment and penetration of high-speed fiber networks and services: why are EU member states lagging behind?” by Wolfgang Briglauer and Klaus Gugler. The authors first explore the investment incentives embedded in the current and prospective EU regulatory framework of asymmetric cost-based access regulation. As a result of their qualitative assessment, the authors find that the EU framework does not provide sufficient incentives for next generation access infrastructure investment. In the next step, the authors perform an empirical analysis that first compares the EU framework with regulatory and state aid policies of representative non-EU27 countries on the basis of a cross-sectional case study. In a second step, the authors examine the dynamics of the penetration of fiber-to-the-home and fiber-to-the-building (FTTH/B) connections by means of non-linear diffusion regressions. The authors find that the penetration targets specified in the Digital Agenda of the EC are, in parts, at odds with the EU regulatory framework. In order to reduce the negative ex-ante investment incentives and push penetration, ex-ante regulation should be directed at increasing the pricing flexibility in the direction of deregulation, and regulators should switch from the asymmetric (legacy-based) regulatory paradigm to a more symmetric one in which regulation is primarily directed toward lowering the total costs by, e.g., enabling cooperation models in the actual building and sharing of fiber infrastructure. Public subsidies can also be justified on economic grounds, especially to supply white areas and to complement private investment, but one has to be aware that this policy might also be subject to substantial governmental failure.

The paper “The interplay of regulation and other drivers of NGN deployment: a real-world perspective” by Nevenka Hrovatin and Matej Švigelj complements the analysis of the first contribution. Their paper presents a case study approach that is based on an in-depth examination of next generation infrastructure deployment in Slovenia with a particular focus on the role of sector-specific regulation. Slovenia is one of the countries with the highest fiber deployment in terms of FTTH/B in Europe, and the Slovenian regulatory authority has implemented the ladder of investment approach in relation to both the incumbents' first generation legacy infrastructure and second generation fiber networks. Hence, the Slovenian case presents a rather interesting and relevant choice. The authors conclude that high access charges on legacy networks provided a significant stimulus for the Slovenian entrant to roll out its own fiber network. High access charges were initiated by (i) the regulator's delays in implementing a proactive regulatory policy, in contrast with the ladder of investment theory, and (ii) the anticompetitive behavior of the Slovenian incumbent. Furthermore, the absence of any regulatory plans to mandate access to fiber at the beginning of the incumbent's fiber deployment also provided a favorable environment for its application. Finally, the authors suggest implementing symmetric regulation of fiber infrastructure to enhance migration to fiber services. They also recommend introducing geographically differentiated access prices since average national access tariffs in Slovenia are too low to enable fiber deployment in suburban areas.

3. The potential cost-savings and economics of investment sharing

Two other papers teach us about the potential cost savings and welfare implications of diverse investment sharing scenarios. As indicated in [Section 2](#), the focus of regulation should be shifted from asymmetric toward a more symmetric regulation with an industry co-coordinating role. As one consequence, regulation also has to balance the social benefits of co-investment agreements to avoid inefficient infrastructure duplication on the one hand and to forestall potential anti-competitive behavior that might result from cooperation among operators on the other hand.

The first paper in this section is by Juan Rendon Schneir and Yupeng Xiong and investigates the “Economic Implications of a Co-investment Scheme for FTTH/PON Architectures.” The authors provide an analysis of cost reductions that can be achieved when co-investment is used for deploying passive infrastructure of FTTH networks. The costs of the passive infrastructure represent the majority of the total investment outlay. The investment per home passed and the investment per home connected for deploying FTTH networks are derived from a cost model for different geotypes, PON architectures and number of alternative operators. Their cost model considers relevant CAPEX and OPEX values to deploy and maintain the network over a timeframe of 15 years. The authors draw three lessons from their analysis. First, a network sharing scheme leads to a strong reduction in the total investment needed by an alternative operator to deploy an FTTH/PON network and to have all homes passed in a region. By analyzing the values of the investment per home passed, it has been shown that there could be a cost reduction of 46.9% on average when two operators share the network and 63.4% when three operators share it. Second, for the GPON, XG-PON, and TWDM-PON architectures, when the total market share is assumed to be equal, the average increase in the cost per home connected between the scenario with two operators and the

scenario with one operator is 6.9%. The average increase between the scenario with three operators and the scenario with one operator is 10.8%. Finally, to be cost competitive with the incumbent operator, the necessary market share that each co-investing alternative operator should achieve is much lower than that of the incumbent operator.

Carlo Cambini and Virginia Silvestri, in their paper “Investment Sharing in Broadband Networks”, provide a theoretical investigation of two different co-investment approaches: basic investment sharing, where the firms share the investment cost and do not pay each other any compensation for the use of the fiber network; joint venture, where the firms share the investment cost and then set an internal access charge for the use of the network that maximizes their joint profits. The case in which the incumbent invests alone and then provides access to its fiber network under regulated conditions is considered the benchmark situation. The authors employ a multi-stage static oligopoly model to assess the impact of the co-investment scenarios on consumer welfare and investments. They show that both investment sharing scenarios are superior compared to the benchmark case. Furthermore, the basic investment sharing case is preferable to the joint venture case in terms of consumer surplus and social welfare since the latter is more likely to have a negative effect on competition. Finally, the authors contrast their results in the case of access regulation and in the absence of regulation, i.e. when the outsider firms’ access charge is set either by the co-investing firms or by the regulator. They find that retail competition is more intense when the access price is regulated but the equilibrium investment level is higher when the co-investing firms are left free to choose the access prices, which is another representation of the classic trade-off between static and dynamic efficiency. As a policy recommendation, the authors suggest a light form of regulation in terms of imposing a no-exclusion obligation, whereas a direct regulation of the access price is considered too strong with respect to the goal of expanding the NGA infrastructures.

4. Regulating access to new communications infrastructure

This final section presents two papers that both presume that mandatory (cost-based) access regulation of next generation infrastructure remains a necessary prerequisite to facilitate and guarantee effective competition in high-speed broadband markets.

Regulatory commitment and uncertainty have always been factors in the interplay between regulation and investment. Markos Tselekounis and Dimitris Varoutas, in their paper “Investments in Next Generation Access infrastructures under regulatory uncertainty”, examine the impact of regulatory uncertainty on an incumbent’s incentives to undertake the socially optimal investments in fiber networks. The authors provide a theoretical analysis of regulatory uncertainty in a regulatory non-commitment setting in which the regulatory authority sets the access price without any credible ex-ante commitment once the network investments are in place. As a result, ex-ante investment by the incumbent operator is subject to regulatory uncertainty as there is some probability that the regulator might deviate from an investment-contingent access pricing rule (which compensates the incumbent for the investment risks) and instead set the access price at the marginal cost of providing the access. The paper explains that the effectiveness of access price regulation on promoting both static and dynamic efficiency not only depends on the underlying demand and cost structure, but is also dependent on the expected probability of deviating from a particular investment-contingent access pricing rule. In particular, the authors find that when the investment cost is not high in relation to the impact of investments on demand, the incumbent underinvests compared to the socially optimal investment level. This implies that the socially desirable outcome cannot be achieved with the incumbent’s profit maximizing investment level even if the regulator commits to a particular investment-contingent access pricing rule. In contrast, when the investment cost is high and the impact of investments on demand is relatively low, the incumbent may overinvest or underinvest depending on the probability of incorporating an access markup in the access price. Hence, in this more realistic case, regulatory uncertainty significantly affects the incumbent’s incentives to undertake the socially optimal investment level.

The final paper in this issue is “How to price the unbundled local loop in the transition from copper to fiber access networks?” by Karl-Heinz Neumann and Ingo Vogelsang, which is concerned with technologically and competitively neutral regulation of unbundled access during the transition phase from copper to fiber networks. The authors consider FTTH the relevant modern equivalent asset for calculating the unbundled access price, which has to incorporate both the access cost differences and the differences in services provided. The latter is referred to as the performance delta, which establishes the value difference between copper and FTTH access and competitive neutrality between both access technologies. The authors perform several numerical simulations to demonstrate the practicability of their approach. The simulations are based on a quantitative competition model which is constructed for a hypothetical country called “Euroland” and represents an extension of the traditional Hotelling model to more than two firms. The authors show that their simulation runs lead to unique and robust results which are consistent with theoretical expectations. In particular, they find that for any given fiber access price, the resulting copper access price converges quickly to a particular value that is independent of the starting price of copper access. Hence, regulators can start the process at current levels of copper access charges, which will generate a glide path to a new stable level. The glide path guarantees that the adaptation will be gradual. Secondly, the method tends to be conservative, meaning that the incumbent will likely receive a higher copper access charge than is theoretically correct. The authors conclude that their approach is superior to traditional cost-based access calculations, which apply “forward-looking long-run incremental costs” principles, in terms of both consumer welfare and incentives to migrate to fiber networks.

5. Conclusions

The papers selected in this special issue are highly relevant in both their practical implications for the future regulatory and public policies and their theoretical insights for the debate on regulation and investment. All the papers address the underlying trade-offs between static and dynamic efficiency but provide different solutions that reflect the differences in the current policy debate. All the papers recognize the need to address efficiency goals, including the need to set appropriate investment signals for deploying new communications infrastructure. However, the recommended policy instruments vary widely, from light handed and more symmetric forms of interventions (“the carrot”) with a stronger focus on dynamic efficiency, to stricter forms of ex-ante regulations (“the stick”) with a pronounced focus on static efficiency. Overall, the controversial debate is far from being resolved and it appears that it is rather extended from first to second generation infrastructure regulation. As the latter is still confronted with a number of open and, in part, new questions, the policy regime imposed should be subject to a critical reappraisal within a short time interval.

In addition to this policy-oriented recommendation, this special issue also entails some direct recommendations for future academic research: first, the current regulatory theory on incentive regulation should be adapted in view of the long-term investment nature of deploying next generation access communications networks. It appears that established access regulations entail good incentives as regards cost reduction but not necessarily for long-term investment decisions. Second, in order to examine the effects of ex-ante regulations imposed on next generation infrastructure, one has to disentangle the underlying strategic behavior between the heterogeneous groups of infrastructure- and service-based operators. Hence, there is a need for rigorous empirical analyses with reliable firm level data which can shed light on the manifold effects of strategic firm behavior under the conditions of ex-ante regulation and migration from old to new infrastructures. Finally, the optimal role of ex-ante access regulations will be crucially impacted by market definition analyses. Again, there is a strong need for empirical analyses that allow regulators to infer the degree of substitution between conventional broadband services and fiber-based communications services and whether the latter constitute a new product within existing markets or a new market with new players and different competitive structures. With respect to all the above-mentioned recommendations it seems that academic research is lagging far behind the relevant policy making processes.

Acknowledgments

The guest editors would like to express special thanks to Erik Bohlin, the journal's Editor-in-Chief, for his comprehensive support and to all the anonymous referees for their highly valuable and insightful and time-consuming reports.

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Available online 20 September 2013

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